

# LAPPING PLATE FOR A LAPPING AND POLISHING MACHINE

This application is a division of an application Ser. No. 07/280,392, filed Dec. 8, 1988, now U.S. Pat. No. 4,974,370.

The conventional design and construction of dual lapping plate machines rotatably supported the lower lap plate from its underside, while the upper lapping plate was carried by a counter weighted overhanging structure. Such a structure is shown in U.S. Pat. No. 4,315,383, issued to Lawrence Day on Feb. 16, 1982. This design required an enormous amount of head room for the machine necessitating a large room, with the machine occupying an inordinate amount of space.

Many prior machines of this type include planetary gear pin drives, such as disclosed in U.S. Pat. Nos. 3,921,342; 4,009,539; 4,020,600; 4,20,231; 4,315,383; and 4,319,432.

These early designed gear pin drive mechanism were expensive to maintain by reason of the excess wear created upon the gear pins by the successive engaging and disengaging of the tooth edge of the work piece carrier, with the stationary drive pins. These prior gear pin drive mechanisms by reason of their fixed positioning interfered with open access to the lapping plate surface and its surrounding work table, necessitating the complicated handling of the work pieces prior and subsequent to the lapping or polishing thereof.

In early lapping machines the lower rotatable lap plate was supported by a rotary union. By their structural arrangement these earlier rotary unions were damaged by the accumulation of liquids spilling over from the lap surface during the lapping and/or polishing operation.

Notwithstanding that the earlier rotary unions attempted to seal the moving parts against contamination by liquids, these seals frequently failed and remained undetected until the accumulation of the liquids totally rendered the rotary union ineffective.

The present invention provides a rotary union which possesses a liquid leak detector that will inform the operator of the presence of liquids before the same can accumulate and infect the union.

Prior machines required and provided for the cooling of the lap plates or polishing pads during operation. These past apparatuses fed cooling liquid upon the lap or pad surfaces or internally thereof, with the arrangement being that such cooling liquids would pass over the face of the plates or be caused to flow therethrough by centrifugal force. Such early systems are disclosed in U.S. Pat. Nos. 3,562,964; 3,603,042; 3,992,820; and 4,471,579.

The present invention discloses a delivery and distributing system which eliminate the possibility of hot spots developing by an uneven or disrupted distribution of the cooling system.

Previously to the present invention most lapping and polishing machines provided a manually positioned splash guard preventing the slurry as employed in the operation from being spilled or sprayed around the surrounding area of the machine. Such splash guards are disclosed in U.S. Pat. Nos. 3,458,959; 4,007,560; 4,432,568; and 4,481,741. The present invention has a movable splash guard which is automatically raised or lowered in relation to the horizontal plane of the lower lap plate and it's surrounding work table, thus providing

a guard that does not interfere with an efficient working process.

## SUMMARY OF THE INVENTION

A new and novel dual lap plate polishing or lapping machine wherein both plates are centrally supported from their undersides, with the uppermost lap plate hydraulically supported through a rotatable quill extending through the open center of the lower lap plate.

The novel design of the new structural concept as above noted is encased within a base which provides a surrounding work table formed with recessed access areas that provides ease of access over the entire circumference of the lapping machine without sacrificing desirable working table area.

The machine of the present invention is provided with a rotary drive pin arrangement for planetary lapping and polishing operations. To reduce or eliminate wear upon the drive pins during the work process the gear pins are provided with a stainless steel ball bearing thus reducing wear friction by converting contacting forces between the pins and the work carrier into rolling friction free contact.

The machine provides a method of height adjustment for the inner pin gear to secure proper positioning of the pins relative to the work piece carrier and lapping plate during the latter's profile change created by the normal wear of the lap plate created by the abrasive action between it and the work piece.

The outer pin gear drive is provided with a pneumatic height adjustment to compensate the position of the outer gear pins relative to the lap wear and for full removal through the horizontal plane of the work table to permit bulk parts loading and unloading.

The machine of this invention is provided with a multi-sectored cooling system for the lower plate to obtain positive uniform cooling thereof without deformations and thermal gradients.

The lower rotating lap plate of the present invention is provided with a rotary union with automatic leakage indicators. In supplying cooling and abrasive working fluids to the lower plate during it's rotation it is mandatory that such fluids be prevented from contaminating the rotary union and thus the present union is provided with a leak detector for indicating the presence of fluids between the rotary union parts before destruction of the same.

To provide a specially designed upper plate for the acceptance of abrasive slurry to be distributed from the under surface of the plate into the working area there is provided a pair of annular channels having different diameters with said channels providing means for delivering the fluid into the working area and to prevent over-flow of the same into non-working areas.

By reason of the novel under side rotary support of the upper lap plate there is required a method to secure proper vertical positioning of the pneumatic cylinder used for raising and lowering the plate, with said means avoiding binding or horizontal shifting of such cylinder during operation of the machine.

By reason of the novel construction of the upper plate there is required a disengagement connection between the upper plate and a lapping and polishing pad, which disengagement means consists of a rotatable bayonet structure.

There is also required in the present machine a structure for releasably locking the upper lap plate in an elevated position when it is disengaged from it's de-